Bioinspired Broadband Antireflection Coatings at Long Wavelengths for Space Applications

Completed Technology Project (2013 - 2016)

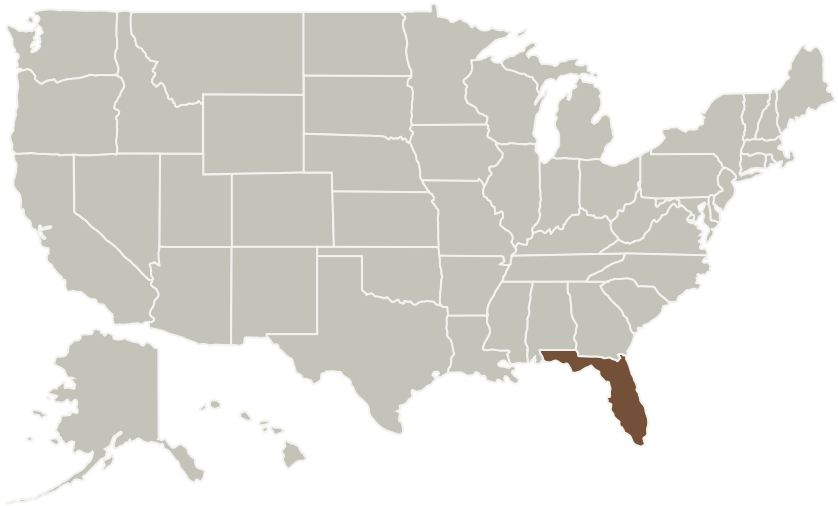
Project Introduction

The cosmic microwave background (CMB) radiation observation is the primary tool for determining the global properties, content, and history of the universe. One efficient way to increase the detection sensitivity of future CMB measurement instruments is to use refractive optics due to the improved detection efficiency and the reduced space, weight, and cost. At long wavelengths from far infrared to millimeter, silicon is a superior material for manufacturing refractive optics because of its excellent transmission and low dispersion. However, due to its very high refractive index, silicon optics suffers from a 30% reflection loss per silicon-air interface. We will develop a new broadband antireflection coating technology inspired by the periodic nanostructures found on the cornea of a moth's eye. The resulting coatings can significantly reduce optical reflection from silicon refractive optics over a wide range of long wavelengths and incident angles.

Anticipated Benefits

In an effort to improve cosmic microwave background (CMB) radiation observation, this project aims to develop coatings, inspired by the periodic nanostructures found on the cornea of a moth's eye, that can significantly reduce optical reflection from silicon refractive optics over a wide range of long wavelengths and incident angles.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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Primary U.S. Work Locations
Florida

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

Program Director:

Claudia M Meyer

Program Manager:

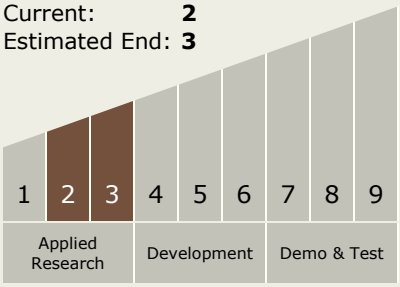
Hung D Nguyen

Principal Investigator:

Peng Jiang

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes